

CLAIMS

WHAT IS CLAIMED IS:

- SUB
B1 7
1. An electrical structure comprising:
a silicon-containing material having a surface; and
an organic layer chemically bonded to the surface of the silicon-containing material,
wherein an electrical property of the electrical structure is significantly changed
compared to a same structure without the organic layer.
 2. The electrical structure of claim 1, wherein the organic layer affects the electrical property
within the silicon-containing material.
 3. The electrical structure of claim 2, wherein the electrical property is selected from a group
consisting of a surface recombination velocity, carrier lifetime, electronic efficiency,
voltage, device capacitance, contact resistance, and resistance of a doped region.
 4. The electrical structure of claim 1, wherein the organic layer comprises a hydrocarbon.
 5. The electrical structure of claim 1, wherein the organic layer comprises a polymer.
 6. The electrical structure of claim 1, wherein:
the silicon-containing material is at least part of a photovoltaic cell; and
the silicon-containing material comprises a region at the surface, wherein the region
has a dopant concentration of at least approximately $1E19$ atoms per cubic
centimeter.
 7. The electrical structure of claim 1, wherein:
the silicon-containing material is at least part of a channel region of a field-effect
transistor; and
the organic layer is at least part of a gate dielectric for the field-effect transistor.

0906157:071204

- SUB
B1 7
16. The process of claim 13, wherein the organic layer comprises a monolayer.
17. The process of claim 13, wherein the organic layer comprises a polymer.
18. The process of claim 13, further comprising doping a portion of the silicon-containing material at the surface, wherein:
- the portion has a dopant concentration of at least approximately 1×10^{19} atoms per cubic centimeter immediately adjacent to the surface;
 - the silicon-containing material is at least part of a photovoltaic cell; and
 - doping is performed before forming the organic layer.
19. The process of claim 13, further comprising forming a gate electrode over the organic layer, wherein:
- the silicon-containing material is at least part of a channel region of a field-effect transistor;
 - the organic layer is at least part of a gate dielectric for the field-effect transistor; and
 - the gate electrode is a control electrode for the field-effect transistor.
20. The process of claim 13, further comprising:
- forming a high-k material; and
 - forming a gate electrode, wherein:
 - the silicon-containing material is at least part of a channel region of a field-effect transistor;
 - the organic layer lies between the silicon-containing material and the high-k material; and
 - the high-k material is at least part of a gate dielectric for the field-effect transistor and lies between the silicon-containing material and the gate electrode.

P0270-29750000

- SUB
B1 7
21. The process of claim 13, wherein forming the organic layer comprises:
activating the surface of the silicon-containing material to form an activated surface;
reacting the activated surface with a chemical, wherein during the reaction, a
hydrocarbon group becomes chemically bonded to the silicon-containing
material.
22. The process of claim 21, wherein activating comprises halogenating the surface of the
silicon-containing material to form the activated surface.
23. The process of claim 22, wherein the hydrocarbon group has no more than nine carbon
atoms.
24. The process of claim 23, wherein the hydrocarbon group is an alkyl group.
25. The process of claim 21, wherein the hydrocarbon group is an allyl group.
26. The process of claim 21, further comprising forming a polymer layer from the allyl
group.
27. The process of claim 21, wherein the hydrocarbon group is an alkoxide group.
28. The process of claim 13, wherein the silicon-containing material is substantially
monocrystalline.
29. The process of claim 13, wherein the silicon-containing material is polycrystalline.
30. The process of claim 13, wherein the silicon-containing material is substantially
amorphous.

T02F20: 25F50660

SUB
B.17

DESIGN

31. A process for forming an electrical device comprising:
- forming a patterned insulating layer over at least of the electrical device, wherein:
 - the patterned insulating layer defines an opening;
 - a silicon-containing region has an exposed portion at the opening; and
 - the silicon-containing region is at least part of an electrical component within the electrical device;
 - forming an organic layer chemically bonded to the surface of the silicon-containing region;
 - removing the organic layer; and
 - forming a metal-containing layer after removing the organic layer, wherein at least a portion of the metal-containing layer contacts the exposed portion of the silicon-containing region, and wherein the metal-containing layer is part of an electrical connection to the silicon-containing region.
32. The process of claim 31, further comprising allowing at least approximately four hours to elapse between forming the organic layer and removing the organic layer.
33. The process of claim 31, further comprising annealing the non-insulating layer to form a metal silicide from the metal-containing layer and the silicon-containing region.
34. The process of claim 31, wherein no etching act is performed between forming and removing the organic layer.
35. A process for forming an electrical device comprising:
- forming a patterned insulating layer over at least of the electrical device, wherein:
 - the patterned insulating layer defines an opening;
 - a silicon-containing region has an exposed portion at the opening; and
 - the silicon-containing region is at least part of an electrical component within the electrical device;
 - forming an organic layer chemically bonded to the surface of the crystalline material;
 - removing the organic layer; and
 - forming a dopant-source layer that contacts the exposed portion of the silicon-containing region.

- SUB 37
B1

Dedication